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ANNOTATED LIST OF SPECIES

Updated checklist of freshwater Decapoda (Brachyura and Caridea) from the Parnaíba river basin, northeastern Brazil, with a new record for the watershed

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Abstract. Our work provides a checklist of freshwater decapods (Brachyura and Caridea) from the Parnaíba river basin, Brazil, based on field collections carried out between 2018 and 2020. Eight species were collected at 30 sampling sites in the main river channels, streams, and ponds throughout the upper, middle, and lower regions of the Parnaíba river basin. The species of shrimp reported herein are *Atya gabonensis* (Gibiel, 1875) (Atyidae), *Macrobrachium amazonicum* (Heller, 1862), *Macrobrachium brasiliense* (Heller, 1862), *Macrobrachium jelskii* (Miers, 1778), and *Macrobrachium olfersii* (Wiegmann, 1836) (Palaemonidae), while crab species reported are *Goyazana castelnaui* (H. Milne-Edwards, 1853), *Sylviocarcinus pictus* (H. Milne-Edwards, 1853) (Trichodactylidae), and *Kingsleya parnaiba* Pralon, Pinheiro & Santana, 2020 (Pseudothelphusidae). The record of *Macrobrachium brasiliense* is the first for the Parnaíba river basin. The knowledge of the diversity of freshwater decapod fauna can contribute to the conservation of species and their habitats.

Key words. Atyidae, distribution records, Palaemonidae, Pseudothelphusidae, range extension, South America, Trichodactylidae

Da Silva GPB, Andrade LKC, Rios DP, Carvalho FL, Pralon BGN (2024) Updated checklist of freshwater Decapoda (Brachyura and Caridea) from the Parnaíba river basin, northeastern Brazil, with a new record for the watershed. Check List 20 (6): 1326–1342. https://doi.org/10.15560/20.6.1326

INTRODUCTION

Freshwater decapods are a highly diverse group occupying a spatially limited resource. Freshwater crabs and shrimps are considered critical components of the freshwater ecosystems of tropical regions worldwide (Cumberlidge et al. 2009; Collen et al. 2014). The presence of freshwater decapods significantly impacts ecological services, including detrital processing and other ecological processes carried out by freshwater fauna (Annawaty et al. 2022). As detritivores and filter feeders, they promote the breakdown of organic matter and control the rate of sedimentation. Furthermore, their bioturbation behaviours exert a direct influence on sediment dynamics, fostering soil oxygenation and promoting the redistribution of nutrients necessary for primary productivity. In lotic systems, the movement patterns of these crustaceans may also contribute to the stabilization of streambanks, while in lentic environments, their trophic interactions play a critical role in modulating populations of microorganisms and other aquatic invertebrates. These processes are essential for the ecological integrity of rivers, lakes, and ponds, and they are fundamental to ecosystem resilience in the face of anthropogenic disturbances (Covich et al. 1999; Geist and Hawkins 2016). The taxonomy and ecology of the freshwater decapod fauna of Brazil are relatively well known (Magalhães 2016), but there is a clear lack of knowledge of the distribution of this fauna at regional scales. In Brazil, the families Atyidae, Palaemonidae, Pseudothelphusidae, and Trichodactylidae, exhibit remarkable species diversity, which is characterized by varying degrees of representation across the country. Four freshwater atyid species, 64 palaemonid species, 21 pseudothelphusid species, and 31 trichodactylid species have been documented in Brazil (Cumberlidge et al. 2014; Magalhães 2016; Alvarez et al. 2021). In the Northeastern region, three species of Atyidae have been recorded, including *Atya gabonensis* (Gibiel, 1875),

OPEN ACCESS

Academic editor: Murilo Zanetti Marochi
Received: 23 July 2024
Accepted: 18 November 2024
Published: 2 December 2024

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Atya scabra (Leach, 1816), and *Potimirim potimirim* (Müller, 1881) (Almeida et al. 2010; Moraes et al. 2017). In the family Palaemonidae, nine species have been documented in the region, namely *Macrobrachium acanthurus* (Wiegmann, 1836), *M. amazonicum* (Heller, 1862), *M. carcinus* (Linnaeus, 1758), *M. denticulatum* Ostrovski, Fonseca & Silva-Ferreira, 1996, *M. jelskii* (Miers, 1877), *M. olfersii* (Wiegmann, 1836), *Palaemon northropi* (Rankin, 1898), *P. pandaliformis* (Stimpson, 1871), and *Typton carneus* Holthuis, 1951 (Pachelle et al. 2016; Lianos et al. 2018; Barros-Alves et al. 2019). In the family Pseudothelphusidae, four species have been reported for this region: *Fredius ibiapaba* Santos et al., 2020, *Fredius reflexifrons* (Ortmann, 1897), *Kingsleya attenboroughi* Pinheiro & Santana, 2016, and *Kingsleya parnaiba* Pralon, Pinheiro & Santana 2020 (Magalhães et al. 2005; Pralon et al. 2020; Santos et al. 2020). In the family Trichodactylidae, five species are known from northeastern Brazil; *Trichodactylus fluviatilis* Latreille, 1828, *Dilocarcinus septemdentatus* (Herbst, 1783), *Goyazana castelnaui* (H. Milne Edwards, 1853), *Sylviocarcinus pictus* (H. Milne Edwards, 1853), and *Valdivia serrata* White, 1847 (Andrade et al. 2018).

Studies on freshwater decapod fauna are scarce for the Parnaíba river basin. This hydrographic basin is the second largest in northeastern Brazil. It is an important transition zone between the semiarid Caatinga in the east of the basin and the Cerrado in the west. A large part of the watershed is relatively pristine, but anthropogenic activities, including the expanding urbanization around the main cities and dam construction, are increasingly threatening biodiversity. Therefore, there is an urgent need for additional basic data on the aquatic biodiversity of the region.

The first studies to report the presence of freshwater decapods in the Parnaíba river basin were based on collections made by foreign explorers (Iheringi 1897; Moreira 1901). Since then, the region has been gradually investigated, but with only a few decapod studies conducted. Júnior and Carvalho (2008) reported the occurrence of the crab *Goyazana castelnaui* in the lower Parnaíba region, while Lianos et al. (2018) have recorded the occurrence of *Macrobrachium* species in this same portion; Pralon et al. (2019) and Rios et al. (2022) investigated the population ecology of *Sylviocarcinus pictus* in the Guaribas River, a subbasin at the south-central region of Piauí and described a new species of Pseudothelphusidae, *Kingsleya parnaiba* (Pralon et al. 2020). Most of the Parnaíba river basin has still received little attention, and inventories of the freshwater decapod biodiversity are lacking, especially in the middle and upper portions of the river basin. Here, we document the occurrence of freshwater decapod species belonging to the families Trichodactylidae, Pseudothelphusidae, Atyidae, and Palaemonidae within all stretches of the Parnaíba river basin. We also include observations on their ecology and distribution.

STUDY AREA

The Parnaíba river basin has a drainage area of 344,112 km^2 and is divided into three portions, the Upper, Middle, and Lower Parnaíba (Lucena et al. 2015). The region of the Parnaíba river basin can be considered a transitional between the Amazon and the backlands of the Northeast (Ramos et al. 2014). It has a predominance of tropical vegetation and presents a tropical climate with intense rains in summer, similar to that in the surrounding Caatinga (thorny scrubland) and Cerrado (savanna) areas. The Parnaíba river basin has a complex hydrological network with six main tributaries distributed across its three subregions. In the Upper Parnaíba, which starts at the headwaters of the Parnaíba River and ends at the Boa Esperança Dam, the major tributaries are the Balsas, Uruçuí Preto, and Gurgueia rivers. In the Middle Parnaíba, which spans from Boa Esperança Dam to the mouth of the Poti River, the Canindé and Poti rivers are prominent, while in the Lower Parnaíba, which extends from the mouth of the Poti River mouth to the Atlantic Ocean, the Longá River is the principal tributary and the last freshwater point without saline intrusion, as its mouth marks the beginning of the coastal region of Piauí (IBGE 2023). The basin also includes lakes, ponds, streams, and a significant reservoir (Boa Esperança Dam), which plays a central role in water storage and regulation in the region. Further information on the geoenvironmental characteristics of the watershed can be found in Rivas (1996).

METHODS

Fieldwork and sampling was carried out from April 2018 to March 2020 at 30 localities on the three portions of the river basin (Figure 1; Table 1). At certain sites, sampling was conducted bimonthly to allow for a consistent temporal dataset (indicated by asterisks in Table 1), while in other locations, sampling was carried out without a fixed periodicity, due to logistical constraints or specific research objectives. This approach enabled a balance between regular data collection in key sites and flexibility in exploring additional areas of interest throughout the basin. Specimens were caught with a tray net (mesh size 3 mm) and traps (described by Pralon et al. 2020), and retained specimens preserved in 80% ethanol. In the laboratory, specimens were identified to species with the help of dichotomous keys available in the works of Holthuis (1952) for palaemonid shrimps, Hobbs and Hart (1982) for atyid shrimps, and Melo (2003) for crabs. The identification of trichodactylid crabs was also based on the system proposed by Magalhães and Turkay (1996). In addition to these papers, we consulted Pralon et al. (2020), which described a new

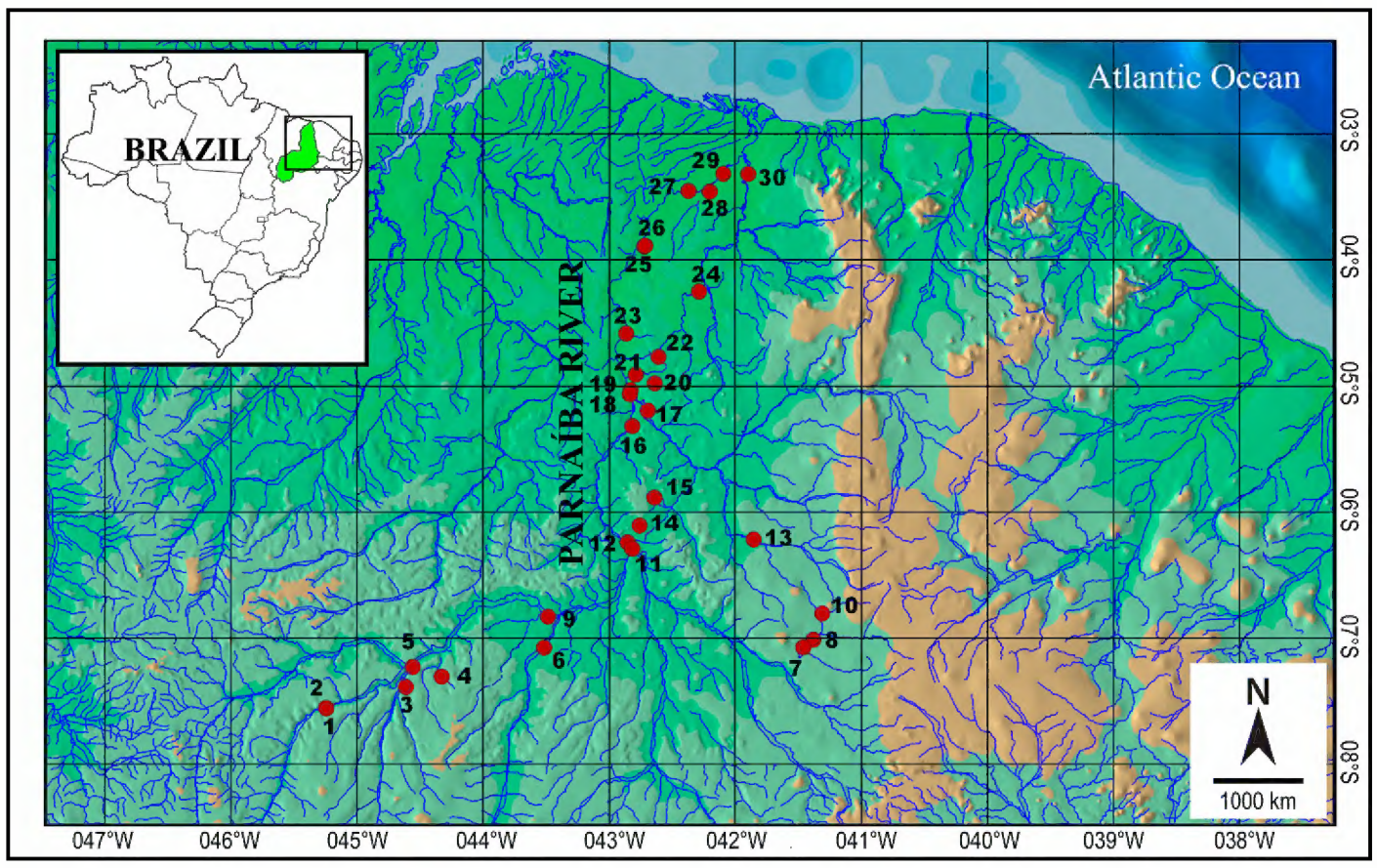

Figure 1. Sampling sites along the Parnaíba River watershed.

Table 1. Municipality, locality, basin region, and geographic coordinates of the sampling sites.

Site	Municipality	Locality	Basin sub-region	Latitude, longitude
1*	Ribeiro Gonçalves	Parnaíba River	Upper	07°33′20″S, 045°14′37″W
2	Ribeiro Gonçalves	Manezinho Creek	Upper	07°33′19″S, 045°14′33″W
3*	Uruçuí	Uruçuí Preto River	Upper	07°23′19″S, 044°36′40″W
4*	Uruçuí	Catapora Creek	Upper	07°18′20″S, 044°19′38″W
5*	Uruçuí	Parnaíba River	Upper	07°13′46″S, 044°33′22″W
6*	Jerumenha	Gurgueia River	Upper	07°04′39″S, 043°30′54″W
7	Picos	Guaribas River	Middle	07°04′28″S, 041°27′33″W
8	Sussuapara	Guaribas River	Middle	07°00′50″S, 041°22′45″W
9	Artur passos	Parnaíba River	Middle	06°49′50″S, 043°29′06″W
10	São Luís do Piauí	Guaribas River	Middle	06°48′20″S, 041°18′29″W
11*	Amarante	Canindé River	Middle	06°17′32″S, 042°48′57″W
12*	Amarante	Parnaíba River	Middle	06°14′28″S, 042°51′17″W
13	Aroazes	Sambito River	Middle	06°13′09″S, 041°51′07″W
14	Angical	Tucano Creek	Middle	06°06′26″S, 042°45′32″W
15*	Água Branca	Água Branca Reservoir	Middle	05°53′10″S, 042°38′27″W
16	Nazária	Parnaíba River	Middle	05°19′16″S, 042°48′29″W
17*	Teresina	Poti River	Middle	05°05′20″S, 042°47′10″W
18*	Teresina	Lagoas do Norte	Middle	05°03′59″S, 042°50′09″W
19	Teresina	Poti River	Middle	05°02′04″S, 042°49′48″W
20	Teresina	Olho D'água Creek	Lower	04°58′50″S, 042°38′18″W
21*	Teresina	União Creek	Lower	04°54′40″S, 042°47′21″W
22*	José de Freitas	Bezerro Dam	Lower	04°46′12″S, 042°36′31″W
23*	União	Parnaíba River	Lower	04°35′09″S, 042°51′51″W
24	Barras	Maratoã River	Lower	04°15′09″S, 042°17′17″W
25	Porto	Parnaíba River	Lower	03°53′37″S, 042°43′16″W
26*	Porto	Deslizes Reservoir	Lower	03°53′23″S, 042°42′49″W
27*	Luzilândia	Parnaíba River	Lower	03°27′15″S, 042°22′15″W
28	Joaquim Pires	Lagoa do Cajueiro	Lower	03°27′36″S, 042°12′08″W
29*	Murici dos Portelas	Parnaíba River	Lower	03°19′08″S, 042°05′38″W
30	Buriti dos Lopes	Longá River	Lower	03°19′10″S, 041°53′42″W

*Indicates sampling sites where bimonthly collections were conducted.

pseudothelphusid species which was not included in the earlier identification keys. The specimens are currently deposited in the Carcinological Collection of the Biology Department of the Federal University of Piauí (CCDBIOUFPI).

RESULTS

We recorded eight species of freshwater decapods in our study. One species of shrimp, *Macrobrachium brasiliense* (Heller, 1862), is newly recorded from the Parnaíba river basin (Table 2). We found four species of Palaemonidae, one Atyidae (Figure 2), two Trichodactylidae, and one Pseudothelphusidae (Figure 3). In Figure 4, we show the distinctive features of the Palaemonidae.

Family Palaemonidae

***Macrobrachium amazonicum* (Heller, 1862)**
Figure 2C, D

Material examined. BRAZIL/URUÇUÍ PRETO RIVER – **Piauí** • Uruçuí; 07°23′19″S, 044°36′40″W; altitude 177 m; 14.III.2020; Sousa, A.S.B leg.; 1♂, 1♀, CCDBIOCCN006. BRAZIL/PARNAÍBA RIVER – **Piauí** • Uruçuí; 07º13′46″S, 044º33′22″W; altitude 173 m; 09.VII.2019; Pralon, B.G.N leg.; 19♂, 7♀, 4♀♀, CCDBIOCCN009. BRAZIL/PARNAÍBA RIVER – **Piauí** • Amarante; 06º14′28″S, 042º51′17″W; altitude 103 m; 31.I.2020; Silva, G.P.B leg.; 3♂, 14♀, CCDBIOCCN016. BRAZIL/CANINDÉ RIVER – **Piauí** • Amarante; 06°17′32″S, 042°48′57″W; altitude 103 m; 24.VII.2018; Silva, G.P.B leg.; 25♂, 21♀, CCDBIOCCN019. BRAZIL/SAMBITO RIVER – **Piauí** • Aroazes; 06°13′09″S, 041°51′07″W; altitude 179 m; 14.VI.2019; Silva, G.P.B leg.; 2♀, CCDBIOCCN024. BRAZIL/ÁGUA BRANCA RESERVOIR – **Piauí** • Água Branca; 05°53′10″S, 042°38′27″W; altitude 222 m; 26.III.2018; Silva, G.P.B leg.; 1♀, CCDBIOCCN028. BRAZIL/POTI RIVER – **Piauí** • Teresina; 05°02′04″S, 042°49′48″W; altitude 56 m; 16.XII.2019; Damasceno, V.E.S leg.; 1♂, 1♀, CCDBIOCCN032. BRAZIL/BEZERRO DAM – **Piauí** • José de Freitas; 04°46′12″S, 042°36′31″W; altitude 126 m; 23.VI.2018; Silva, G.P.B leg.; 1♂, 2♀, CCDBIOCCN037. BRAZIL/PARNAÍBA RIVER – **Piauí** • União; 04º35′09″S, 042º51′51″W; altitude 59 m; 25.VI.2018; Silva, G.P.B leg.; 1♂, 1♀, CCDBIOCCN040. BRAZIL/MARATOÃ RIVER – **Piauí** • Barras; 04°15′09″S, 042°17′17″W; 83 altitude m; 18.VIII.2018; Damasceno, V.E.S leg.; 5♂, 1♀, CCDBIOCCN043. BRAZIL/CAJUEIRO LAKE – **Piauí** • Joaquim Pires; 03°27′36″S, 042°12′08″W; altitude 16 m; 24.VI.2018; Pralon, B.G.N leg.; 1♂, 1♀, CCDBIOCCN046. BRAZIL/PARNAÍBA RIVER – **Piauí** • Luzilândia; 03°27′15″S, 042º22′15″W; altitude 17 m; 19.VIII.2018; Silva, G.P.B leg.; 18♂, 7♀, CCDBIOCCN050. BRAZIL/DESLIZES RESERVOIR – **Piauí** • Porto;

Table 2. Species per sampling site along the Parnaíba River watershed.

Site	Atyidae	Palaemonidae				Pseudothelphusidae	Trichodactylidae	
	A. gabonensis	*M. amazonicum*	*M. brasiliense*	*M. jelskii*	*M. olfersii*	*K. parnaiba*	*G. castelnaui*	*S. pictus*
1			X	X				
2			X	X		X		
3		X	X	X				
4			X					
5		X	X	X			X	
6				X				
7				X				
8				X				
9					X			
10								X
11		X		X	X		X	
12		X		X	X			X
13		X	X	X				
14				X			X	
15		X		X			X	
16					X			X
17	X							
18				X				
19		X			X			
20				X			X	
21				X			X	
22		X		X			X	
23		X		X	X			
24		X		X	X		X	
25				X				
26		X		X				
27	X	X		X	X			
28		X		X				
29		X		X	X		X	X
30		X		X				X

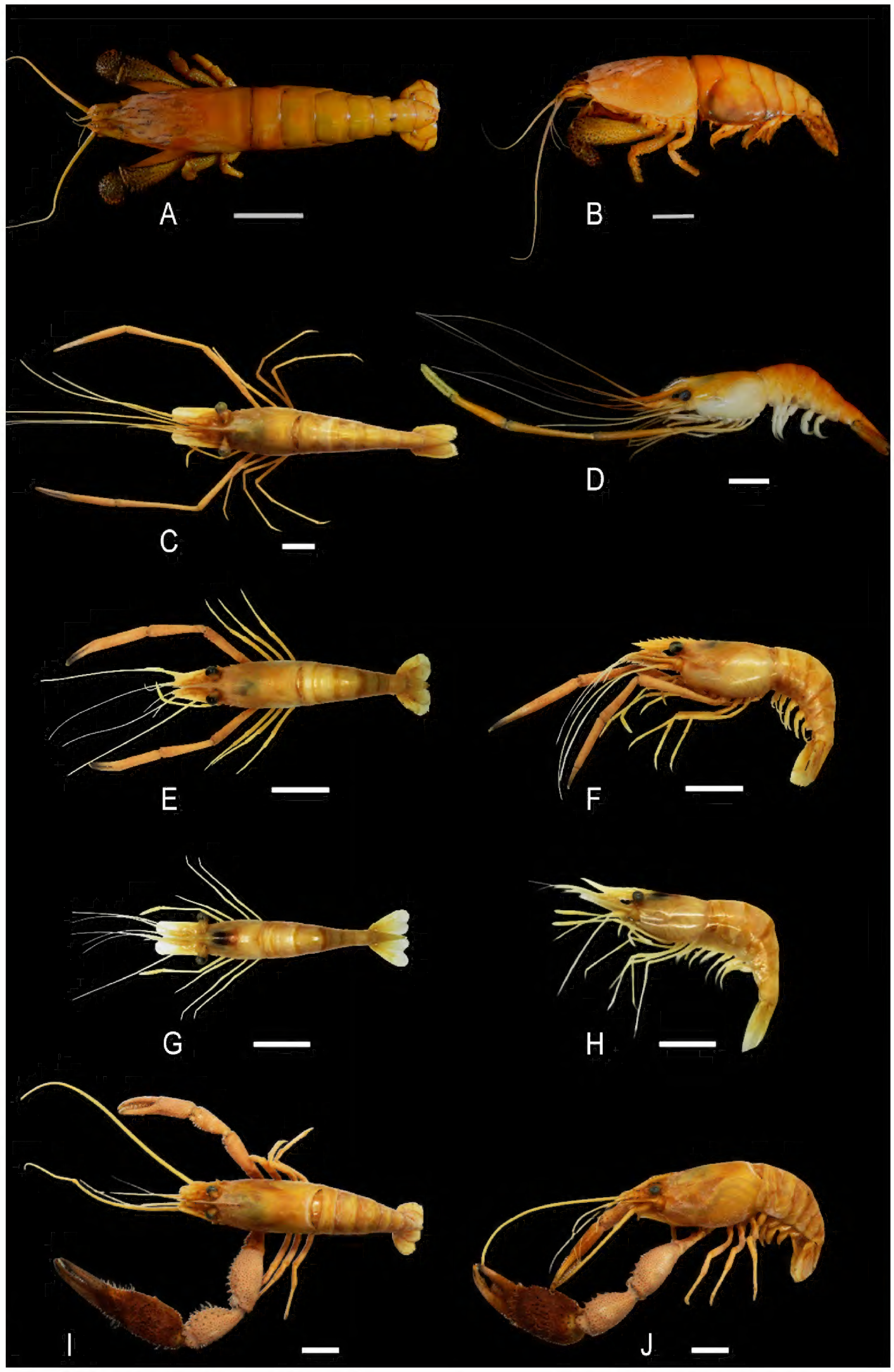

Figure 2. Shrimp species in dorsal and lateral view. **A, B.** *Atya gabonensis*. **C, D.** *Macrobrachium amazonicum*. **E, F.** *M. brasiliense*. **G, H.** *M. jelskii*. **I, J.** *M. olfersii*. Scale bars = 10 mm.

03°53′23″S, 042°42′49″W; altitude 33 m; 23.VI.2018; Damasceno, V.E.S leg.; 2♀, CCDBIOCCN053. BRAZIL/PARNAÍBA RIVER – **Piauí** • Murici dos Portelas; 03°19′08″S, 042°05′38″W; altitude 15 m; 14.XII.2018; Nascimento, A.C. leg.; 2♂, 7♀, CCDBIOCCN058. BRAZIL/LONGÁ RIVER – **Piauí** • Buriti dos Lopes; 03°19′10″S, 041°53′42″W; altitude 8 m; 09.VI.2019; Silva, G.P.B. leg.; 7♂, 15♀, CCDBIOCCN062.

Identification. Rostrum long and slender, reaching beyond the scaphocerite and directed anteriorly upwards; upper margin with 9–12 teeth, the first being located behind the orbit; first 7 teeth are brought together forming a basal ridge on proximal half of rostrum; last teeth more widely spaced, the last being near the end, differing from close congeners like *M. brasiliense* and *M. jelskii*. Ventral margin of rostrum with 8–10 teeth, more widely spaced distally. Pleura of fifth abdominal somite with small but distinct spine. Telson ends in an acute midpoint (Figure 4B), with 2 pairs of spines on the upper margin, inner pair not reaching tip of telson. Second leg, in adult, is strongest, reaching entire length of the carpus, beyond the scaphocerite; fingers ¾ length of the palm, covered by strong layer of bristles; sharp faces of both fingers

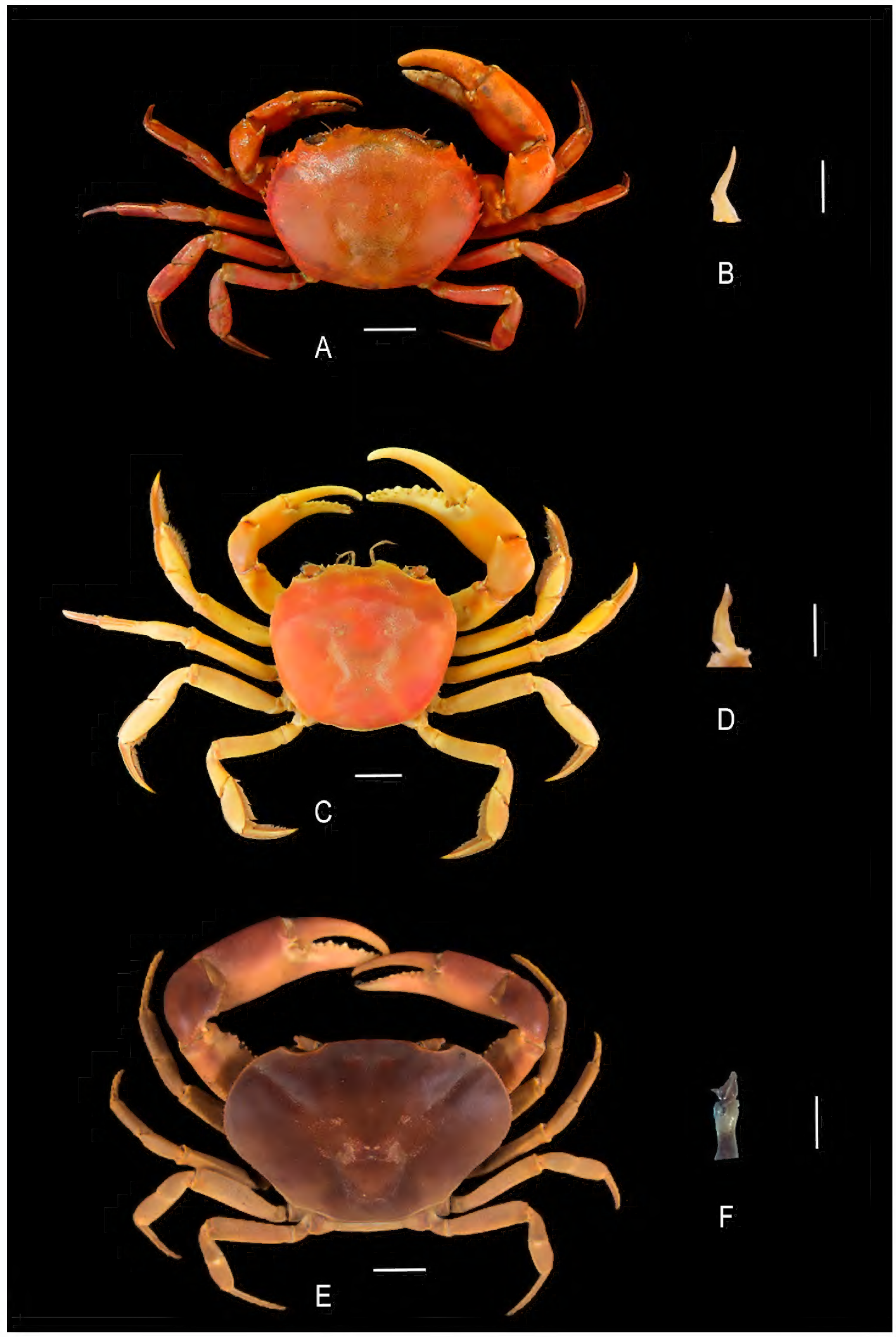

Figure 3. Crab species in dorsal view, with gonopods positioned laterally. **A, B.** *Goyazana castelnaui*. **C, D.** *Sylviocarcinus pictus*. **E, F.** *Kingsleya parnaiba*. Scale bars = 10 mm.

with strong proximal tooth; palm elongated and with numerous spinules; carpus with spinules too; only ⅔ of carpal length. Last 3 pereiopods elongated, third reaching end of scaphocerite; third leg propod 3 times length of dactyl; adult males with merus, carpus, and propod covered by short spinules; in females, spinules absent (Melo 2003).

Distribution. Endemic to South America, with a wide geographical distribution including the Amazon and Orinoco river basins, rivers between these basins (Holthuis 1952; Odinetz-Collart 1996; Bentes et al. 2011), and rivers and estuaries in the Guyanas, Venezuela, Colombia, and the northern and northeastern coasts of Brazil (Holthuis 1952; Melo 2003; Campos and Valencia 2007). Inland populations have been reported from the Pantanal, Upper Paraná, and Paraguay basins in Brazil (Bialetzki et al. 1997; Magalhães 2000; Melo 2003; Rodríguez and Magalhães 2005; Anger 2013; Hayd and Anger 2013), Panama, Peru, Bolivia, Paraguay, and Argentina (Pilcomayo river basin) (Pettovello 1996; Melo 2003; Vergamini et al. 2011). This species has also been recorded in the São Francisco River in northeastern Brazil, which is successful colonization beyond this species' native range (Santos and Coelho-Filho 2021).

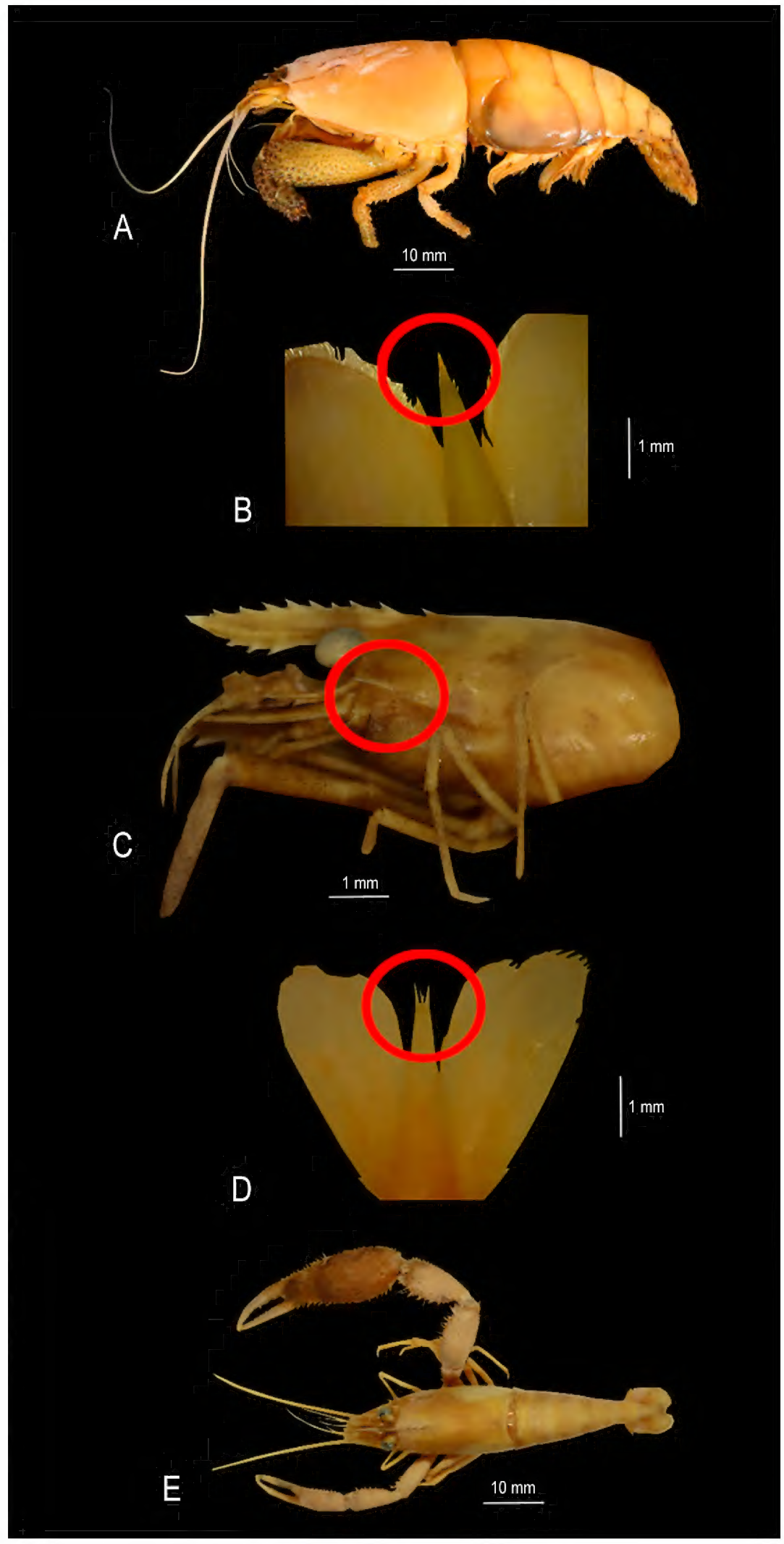

Figure 4. Distinctive morphological characteristics of five palaemonids. **A.** *Atya gabonensis*, cephalic region of carapace strongly sculptured. **B.** *Macrobrachium amazonicum*, telson with a sharp, conical distal end, not forming a distinct posterior margin. **C.** *M. brasiliense*, carapace with many spinules anterolaterally. **D.** *M. jelskii*, telson with a pointed end featuring two pairs of spines on the posterior margin. **E.** *M. olfersii*, palm of the second pair of pereiopods with distinct velvety pubescence on the dorsal and ventral surfaces.

Ecology. *Macrobrachium amazonicum* displays marked plasticity in terms of its morphology and ecology (Freire et al. 2012), as well as genetic (Weiss et al. 2015), physiological (Augusto and Valenti 2016), and behavioral differences (Pantaleão et al. 2014) which allow it to survive under varied environmental conditions of different habitats, including both lentic and lotic water bodies (Taddei et al. 2017). Inland populations usually have low fecundity, with large eggs and benthic larvae (Meireles et al. 2013), which is in contrast to estuarine species, which have high fecundity, small eggs, and planktonic larvae (Odinetz-Collart and Rabelo 1996; Bauer 2011).

Additional notes. All three male morphotypes of this polymorphic species were registered in our study. It reaches a length of 16 cm and a weight of 30 g, and its meat has a firmer texture and a more marked taste compared to *M. rosenbergii* De Man, 1879; thus, it is better accepted by consumers (Moraes-Riodades and Valenti 2002). The species is extensively consumed by populations in the Amazon region (Moraes-Riodades and Valenti 2002) and the Brazilian Northeast (Moraes-Riodades and Valenti 2004) and shows great potential for aquaculture (Bernard et al. 2010).

***Macrobrachium brasiliense* (Heller, 1862)**
Newly recorded
Figure 2E, F

Material examined. BRAZIL/MANEZINHO CREEK – **Piauí** • Ribeiro Gonçalves; 07°33′19″S, 045°14′33″W; altitude 196 m; 14.IX.2019; Silva, G.P.B. leg.; 1♂, 3♀, 1♀♀, CCDBIOCCN003. BRAZIL/PARNAÍBA RIVER – **Piauí** • Ribeiro Gonçalves; 07°33′20″S, 045°14′37″W; altitude 210 m; 28.XI.2018; Silva, G.P.B leg.; 3♂, 1♀, CCDBIOCCN001. BRAZIL/URUÇUÍ PRETO RIVER – **Piauí** • Uruçuí; 07°23′19″S, 044°36′40″W; altitude 177 m; 26.VII.2018; Silva, G.P.B. leg.; 2♂, 4♀, CCDBIOCCN007. BRAZIL/PARNAÍBA RIVER – **Piauí** • Uruçuí; 07°13′46″S, 044°33′22″W; altitude 173 m; 31.III.2019; Pralon, B.G.N. leg.; 1♂, CCDBIOCCN010. BRAZIL/CATAPORA CREEK – **Piauí** • Uruçuí; 07°18′20″S, 044°19′38″W; altitude 237 m; 25.III.2018; Damasceno V.E.S leg.; 2 ♂, 1 ♀, CCDBIOCCN012. BRAZIL/SAMBITO RIVER – **Piauí** • Aroazes; 06°13′09″S, 041°51′07″W; altitude 179 m; 24.XI.2018; Silva, G.P.B leg.; 1 ♂, CCDBIOCCN026.

Identification. Rostrum straight and a little high, reaching a little beyond the antennular peduncle, not reaching end of scaphocerite, differing from *M. amazonicum*. Upper margin with 8–11 regularly spaced teeth, first 2 behind the orbit, third just above it. Lower margin with 2 or 3 teeth. Carapace with many spinules anterolaterally (Figure 4C), also distinct. Pleura of fifth abdominal somite ending in sharp point. Posterior margin of telson reached by inner pair of spines of the posterior margin. Chelipeds equal in shape but different in size. Greater chela reaches with the entire carpus beyond the scaphocerite; fingers ½ length of palm; dactyl with 2 large teeth on cutting face, among them several smaller teeth; line of 4–11 tubercles on inner surface of the fixed finger; palm covered by small spinules; ischium more than half length of grouper. Young specimens have shortest chela, reaching beyond the scaphocerite with only part of the carpus, palm also relatively shorter (Melo 2003).

Distribution. This species can be found in ten South American countries: Bolivia. Paraguay, Colombia, Venezuela, Guyana, Suriname, French Guiana, Ecuador, Peru, Brazil (Roraima, Amapá, Pará, Amazonas, Maranhão, Piauí, Tocantins, Mato Grosso, Bahia, Acre, Goiás, Minas Gerais, Mato Grosso do Sul, São Paulo, Paraná) (Pileggi et al. 2013; Rossi et al. 2020).

Ecology. *Macrobrachium brasiliense* can be found in the main channel of large rivers, streams, lakes, "igapós", and upland "igarapés" (García-Dávila et al. 2000). The species has a distinct sexual dimorphism and an omnivorous habit, consuming diverse items, such as insect remains (particularly larvae of Chironomidae), diatoms, Oligochaeta, plant fragments, filamentous fungi, sand, or non-identified organic matter (Melo and Nakagaki 2013). Recently it was found that males of this species display polymorphism (Nogueira et al. 2020).

***Macrobrachium jelskii* (Miers, 1778)**
Figure 2G, H

Material examined. BRAZIL/PARNAÍBA RIVER – **Piauí** • Ribeiro Gonçalves; 07°33′20″S, 045°14′37″W; altitude 210 m; 30.I.2020; Andrade. L.K.C. leg.; 3 ♂, 1 ♀, CCDBIOCCN002. BRAZIL/MANEZINHO CREEK – **Piauí** • Ribeiro Gonçalves; 07°33′19″S, 045°14′33″W; altitude 196 m; 08.VII.2019; Silva, G.P.B. leg.; 1 ♂, 1 ♀, CCDBIOCCN004. BRAZIL/URUÇUÍ PRETO RIVER – **Piauí** • Uruçuí; 07°23′19″S, 044°36′40″W; altitude 177 m; 14.IX.2019; Lima, A.K.M. leg.; 3 ♂, 1 ♀, CCDBIOCCN070. BRAZIL/PARNAÍBA RIVER – **Piauí** • Uruçuí; 07°13′46″S, 044°33′22″W; altitude 173 m; 20.V.2018; Silva, G.P.B. leg.; 4 ♂, 5 ♀, CCDBIOCCN011. BRAZIL/GURGUEIA RIVER – **Piauí** • Jerumenha; 07°04′39″S, 043°30′54″W; altitude 132 m; 26.VII.2018; Silva, G.P.B. leg.; 8 ♂, 5 ♀, CCDBIOCCN013. BRAZIL/GUARIBAS RIVER – **Piauí** • Picos; 07°04′28″S, 041°27′33″W; altitude 203 m; 01.V.2013; Silva, A.A.S. leg.; 1 ♂, 2 ♀, CCDBIOCCN067. BRAZIL/GUARIBAS RIVER – **Piauí** • Sussuapara; 07°00′50″S, 041°22′45″W; altitude 213 m; 01.V.2013; Silva, A.A.S. leg.; 45 ♂, 31 ♀, CCDBIOCCN065. BRAZIL/CANINDÉ RIVER – **Piauí** • Amarante; 06°17′32″S, 042°48′57″W; altitude 103 m; 09.I.2019; Damasceno, V.E.S. leg.; 33 ♂, 20 ♀, CCDBIOCCN021. BRAZIL/PARNAÍBA RIVER – **Piauí** • Amarante; 06°14′28″S, 042°51′17″W; altitude 103 m; 20.V.2019; Pralon, B.G.N. leg.; 1 ♂, 2 ♀, CCDBIOCCN017. BRAZIL/TUCANO CREEK – **Piauí** • Angical; 06°06′26″S, 042°45′32″W; altitude 185 m; 01.IV.2019; Silva, G.P.B. leg.; 1 ♂, CCDBIOCCN023. BRAZIL/SAMBITO RIVER – **Piauí** • Aroazes; 06°13′09″S, 041°51′07″W; altitude 179 m; 03.VI.2017; Pralon, B.G.N. leg.; 1 ♂, 16 ♀, CCDBIOCCN025. BRAZIL/ÁGUA BRANCA RESERVOIR – **Piauí** • Água Branca; 05°53′10″S, 042°38′27″W; altitude 222 m; 09.I.2019; Andrade, K.S.F. leg.; 5 ♂, 3 ♀, CCDBIOCCN029. BRAZIL/LAGOAS DO NORTE – **Piauí** • Teresina; 05°03′59″S, 042°50′09″W; altitude 60 m; 25.VI.2018; Damasceno, V.E.S. leg.; 22 ♂, 22 ♀, CCDBIOCCN033. BRAZIL/OLHO D'ÁGUA CREEK – **Piauí** • Teresina; 04°58′50″S, 042°38′18″W; altitude 110 m; 20.IV.2020; Silva, G.P.B. leg.; 4 ♂, 9 ♀, CCDBIOCCN035. BRAZIL/UNIÃO CREEK – **Piauí** • Teresina; 04°54′40″S, 042°47′21″W; altitude 67 m; 06.VI.2019; Marques, A. K. leg.; 2 ♂, CCDBIOCCN072. BRAZIL/BEZERRO DAM – **Piauí** • José de Freitas; 04°46′12″S, 042°36′31″W; altitude 126 m; 18.X.2018; Silva, G.P.B leg.; 2 ♂, 11 ♀, CCDBIOCCN038. BRAZIL/PARNAÍBA RIVER – **Piauí** • União; 04°35′09″S, 042°51′51″W; altitude 59 m; 20.VIII.2018; Andrade, K.S.F. leg.; 2 ♂, 10 ♀, CCDBIOCCN041. BRAZIL/MARATOÃ RIVER – **Piauí** • Barras; 04°15′09″S, 042°17′17″W; altitude 82 m; 18.VIII.2018; Damasceno, V.E.S. leg.; 17 ♂, 10 ♀, CCDBIOCCN044. BRAZIL/PARNAÍBA RIVER – **Piauí** • Porto; 03°53′37″S, 042°43′16″W;

altitude 30 m; 21.IV.2018; Silva, G.P.B. leg.; 4 ♂, 6 ♀, CCDBIOCCN052. BRAZIL/DESLIZES RESERVOIR – **Piauí** • Porto; 03°53′23″S, 042°42′49″W; altitude 33 m; 18.VIII.2018; Costa, J.M. leg.; 57 ♂, 8 ♀, CCDBIOCCN054. BRAZIL/CAJUEIRO LAKE – **Piauí** • Joaquim Pires; 03°27′36″S, 042°12′08″W; altitude 14 m; 24.VI.2018; Pralon, B.G.N. leg.; 6 ♂, 46 ♀, CCDBIOCCN047. BRAZIL/PARNAÍBA RIVER – **Piauí** • Luzilândia; 03°27′15″S, 042°22′15″W; altitude 17 m; 22.IV.2018; Silva, G.P.B. leg.; 1 ♂, CCDBIOCCN051. BRAZIL/PARNAÍBA RIVER – **Piauí** • Murici dos Portelas; 03°19′08″S, 042°05′38″W; altitude 15 m; 24.VI.2018; Silva, G.P.B. leg.; 2 ♂, 2 ♀, CCDBIOCCN059. BRAZIL/LONGÁ RIVER – **Piauí** • Buriti dos Lopes**;** 03°19′10″S, 041°53′42″W; altitude 8 m; 09.VI.2019; Silva, G.P.B. leg.; 2 ♂, 2♀, CCDBIOCCN064.

Identification. Slender rostrum, with tip curved upwards, reaching beyond scaphocerite; superior margin with 5–8 teeth, subapical excluded, first situated behind orbit and second on or a little behind orbital margin; teeth evenly divided over proximal half of the rostrum; distal half disarmed but with 2 small subapical teeth, unlike *M. amazonicum* (last teeth widely spaced, the last being near the end); lower margin with 5 or 6 teeth. Posterior margin of telson ends in acute median tooth (Figure 4D), flanked by 1 long internal spine and a short external spine, unlike *M. amazonicum*, which has 2 pairs of spines on upper margin, inner pair not reaching tip of telson; internal spines extend beyond posterior margin of telson. Equal chelipeds, reaching with most of the chela beyond the scaphocerite; slender and entirely smooth; fingers ¾ length of palm; elongated carpus, 1.2–1.5 times longer than palm; merus as long or little shorter than that one. Males have cheliped like females. Last 3 pereiopods with all segments smooth, except for row of spines on lower margin of propodus (Melo 2003).

Distribution. Inland waters of Trinidad, Venezuela, Suriname, French Guiana, Peru, Bolívia, Costa Rica, Argentina (Paraná, Paraguay and Pilcomayo Rivers), Brazil (Acre, Amapá, Amazonas, Pará, Roraima, Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, Bahia, Mato Grosso, Espírito Santo, Rio de Janeiro, Minas Gerais, São Paulo, Paraná, Santa Catarina) (Collins 2000; Melo 2003; Pileggi et al. 2013; Vera-Silva et al. 2016; Lianos et al. 2018). Its range and distribution rare both natural and influenced anthropogenic factors.

Ecology. *Macrobrachium jelskii* is often found in turbid waters, with marginal vegetation and muddy substrate, or in clear waters with grasses and a substrate of stones and sand. It is omnivorous and feeds on insect larvae, algae, and sediment grains (Melo 2003). This species is commonly found in association with roots of aquatic plants, which are used as nutritional resources and protection for ovigerous females and individuals of different stages of development, including larvae (Montoya 2003; Lima et al. 2013).

Additional notes. The occurrence of *M. jelskii* in hydrographic basins of the Brazilian Northeast and Southeast has been considered the result of anthropogenic actions. In some regions of Brazil, this species is economically important in the aquarium trade and used as artisanal fishing bait and food by riverine populations (Rocha and Barbosa 2017). Analyses of molecular data using the mitochondrial COI and 16S genes suggest the division of the species into two clades, an Amazonian and a coastal clade; the coastal clade occurs in Bahia and Espírito Santo (Vera-Silva et al. 2016).

***Macrobrachium olfersii* (Wiegmann, 1836)**

Figure 2I, J

Material examined. BRAZIL/PARNAÍBA RIVER – **Piauí** • Artur Passos; 06°49′50″S, 043°29′06″W; altitude 124 m; 21.V.2016; Pralon, B.G. N. leg.; 5 ♂, 5 ♀, CCDBIOCCN076. BRAZIL/PARNAÍBA RIVER – **Piauí** • Amarante; 06°14′28″S, 042°51′17″W; altitude 103 m; 24.IX.2018; Silva, G.P.B. leg.; 1 ♂, 1 ♀, CCDBIOCCN015. BRAZIL/CANINDÉ RIVER – **Piauí** • Amarante; 06°17′32″S, 042°48′57″W; altitude 103 m; 26.III.2018; Silva, G.P.B. leg.; 3 ♂, CCDBIOCCN020. BRAZIL/POTI RIVER – **Piauí** • Teresina; 05°02′04″S, 042°49′48″W; altitude 56 m; 25.II.2019; Andrade, K.S.F. leg.; 2 ♂, CCDBIOCCN031. BRAZIL/PARNAÍBA RIVER – **Piauí** • União; 04°35′09″S, 042°51′51″W; altitude 59 m; 25.II.2019; Andrade, K.S.F. leg.; 3 ♂, 2 ♀, CCDBIOCCN039. BRAZIL/MARATOÃ RIVER – **Piauí** • Barras; 04°15′09″S, 042°17′17″W; altitude 82 m; 13.XII.2018; Silva, G.P.B. leg.; 1 ♂, CCDBIOCCN045. BRAZIL/PARNAÍBA RIVER – **Piauí** • Luzilândia; 03°27′15″S, 042°22′15″W; altitude 17 m; 24.VI.2018; Silva, G.P.B. leg.; 16 ♂, 2 ♀, CCDBIOCCN049. BRAZIL/PARNAÍBA RIVER – **Piauí** • Murici dos Portelas; 03°19′08″S, 042°05′38″W; altitude 15 m; 20.X.2018; Damasceno, V.E.S. leg.; 1 ♂, 3 ♀, CCDBIOCCN057. BRAZIL/PARNAÍBA RIVER – **Piauí** • Nazária; 05°19′16″S, 042°48′29″W; altitude 68 m; 05.IV.2016; Silva, A.A.S. leg.; 1 ♂, 1 ♀, CCDBIOCCN069.

Identification. Rostrum straight or slightly downward, reaching end of antennular peduncle; upper margin with 12–15 teeth, 4 or 5 placed behind orbit, all evenly divided. *M. denticulatum* Ostrovski, Da Silva-Ferreira & Da Fonseca, 1996, a very similar congener, has more space between first 2 spines of the rostrum; lower margin with 3 or 4 teeth. Hepatic spine smaller than antennal. Telson with sharp posterior margin overtaken by inner pair of posterior spines, with many setae between them. Second pereiopods of adult males strongly unequal in shape and size; largest reaches with all the carpus or part of the merus beyond the scaphocerite; fingers with hiatus and longer than palm, unlike *M. denticulatum* (fingers slightly shorter than palm) sharp face with large proximal tooth and external face with rows of small longitudinal spinules, strong

spines on lower margin of the fixed finger; inside the cutting face, a large number of setae; palm elongated, slightly compressed with strong velvety pubescence (Figure 4E); carpus slightly smaller than palm in adults and as long as merus; carpus and merus with rows of spines, smaller and denser dorsally; smaller cheliped reaches with only part of the carpus beyond the scaphocerite (Ostrovski et al. 1996; Melo 2003).

Distribution. This species is widely distributed in the Americas: North America (North Carolina, Florida, Texas), Central America (Mexico, Costa Rica, Nicaragua, Panama), and South America (Colombia, Venezuela, Guyana, Suriname, and Brazil). In Brazil, it is recorded from the states of Pará, Maranhão, Piauí, Ceará, Rio Grande do Norte, Pernambuco, Alagoas, Sergipe, Bahia, Minas Gerais, Espírito Santo, Rio de Janeiro, São Paulo, Paraná, Santa Catarina, and Rio Grande do Sul (Melo 2003; Rossi and Mantelatto 2013; Andrade et al. 2017; Moraes et al. 2021). Despite its wide distribution and high morphological intraspecific variation, genetic analyses support that *M. olfersii* populations from the Caribbean and Brazil are a single species, showing continuous gene flow among populations (Rossi and Mantelatto 2013).

Ecology. *Macrobrachium olfersii* depends on estuarine water to complete larval development (Anger and Moreira 1998; Mossolin and Bueno 2002). This physiological dependence on brackish water restricts the distribution of the species to rivers that flow directly to the sea. Berried females produce numerous small eggs, and the planktotrophic larvae pass through 12 zoeal stages before metamorphosis (Dugger and Dobkin 1975; Mossolin and Bueno 2002). This species, which has a markedly heterochely in both sexes (Mossolin and Bueno 2003) and is polymorphic; its male morphotypes have only been recently described (Rossi et al. 2022).

Family Atyidae

***Atya gabonensis* (Gibiel, 1875)**
Figure 2A, B

Material examined. BRAZIL/POTI RIVER – **Piauí** • Teresina; 05°02′04″S, 042°49′48″W; altitude 56 m; 06.VIII.2014; Pralon, B.G.N leg.; 3 ♀, CCDBIOCCN030. BRAZIL/PARNAÍBA RIVER – **Piauí** • Luzilândia; 03°27′15″S, 042°22′15″W; altitude 17 m; 19.VIII.2018, Pralon, B.G.N leg.; 8 ♂, 21 ♀, CCDBIOCCN048.

Identification. Cephalic region of carapace strongly sculptured (Figure 4A), but spines limited to antennal, pterygostomian, and occasionally ventral and often lateral rostral; pterygostomian spine rather weak. Rostrum with margins suddenly contracted, forming distinct angle anterior to orbit, angle often produced anteriorly; dorsal surface without row of strong spines but with low median carina. Ventral margin of abdominal pleura lacking sclerotized spinules, differing from *A. margaritacea* A. Milne-Edwards, 1864 (ventral margin of third, fourth, and fifth pleura with linear clusters of 15, 17, and 9 corneous denticles, respectively). Sternum of fifth abdominal segment with median tubercle produced in curved hornlike projection usually overreaching midlength of sixth sternite when abdomen flexed. Sternum of sixth abdominal segment approximately ½ as long as wide. Preanal carina subconical, directed almost ventrally. Telson 1.2–1.4 times as long as broad, bearing paired arched dorsal rows of 4 or 5 spines, unlike *A. margaritacea* (Telson ca. 1.8 times as long as wide, dorsal surface bearing paired mesially concave rows of 6 denticles each and posteromedian tubercle). Antennular peduncle with dorsal surface of proximal article bearing 1–6 spinules proximal to distal row; penultimate article 1.4–1.5 times as long as wide, bearing scattered sclerotized spinules in lateral half of dorsal surface. Coxae of third and fourth pereiopod lacking prominent spine anterolaterally. Third pereiopod with merus somewhat flattened ventrally, about 2.5 times as long as high; ventromesial surface parallel to that of corresponding podomere of other third pereiopod, and lateral surface bearing irregular rows of heavy corneous tubercles with flattened, often frayed, scalelike extremities; propodus 1.6–1.9 times as long as broad; extensor surface studded with stalked corneous tubercles similar to merus and with very few widely spaced ones on flexor surface, most tubercles on later surface flanked distally by clusters of plumose setae; dactyl at least slightly movable, its flexor surface bearing 1 to several tubercles in cluster just proximal to corneous tip (Hobbs and Hart 1982).

Distribution. *Atya gabonensis* has a discontinuous distribution: in western Africa, it ranges from Senegal southward to Zaire (most of the localities are in the Niger and Volta river basins), and in northern South America it has been found in the Parnaiba, Suriname, and Orinoco basins in Brazil (Maranhão, Piauí, Alagoas, Sergipe, Rio de Janeiro and São Paulo), Suriname, and Venezuela, respectively (Hobbs and Hart 1982; Melo 2003; Mantelatto et al. 2016). Recent molecular systematic assessments have corroborated the taxonomic status of *A. gabonensis*, confirming its distinctiveness and wide distribution (Oliveira et al. 2021).

Ecology. *Atya gabonensis* was first reported from Gabon. It inhabits clear waters, burrows on root masses, crevices, and rocky bottoms, and feeds on algae, diatoms, insect parts, and organic detritus, and thus, it is considered an omnivorous detritivore (Obande and Kusemiju 2008). It reproduces continuously throughout the year, and females can bear 850–12,220 eggs (Nwosu 2009). It is sexually dimorphic (Madeleine et al. 2015).

Additional notes. This species has biogeographical importance and is of scientific interest, since its amphi-Atlantic distribution can only be explained by a former connection between Africa and South America (Hobbs and Hart 1982).

Family Trichodactylidae

***Goyazana castelnaui* (H. Milne-Edwards, 1853)**
Figure 3A, B

Material examined. BRAZIL/PARNAÍBA RIVER – **Piauí** • Uruçuí; 07°13′46″S, 044°33′22″W; altitude 173 m; 31.III.2019; Silva, G.P.B. leg.; 1 ♂, 1 ♀, CCDBIOCCN008. BRAZIL/CANINDÉ RIVER – **Piauí** • Amarante; 06°17′32″S, 042°48′57″W; altitude 103 m; 27.VII.2018; Silva, G.P.B. leg.; 3 ♂, 7 ♀, CCDBIOCCN018. BRAZIL/TUCANO CREEK – **Piauí** • Angical; 06°06′26″S, 042°45′32″W; altitude 184 m; 21.V.2018; Silva, G.P.B. leg.; 1 ♂, 2 ♀, CCDBIOCCN022. BRAZIL/ÁGUA BRANCA RESERVOIR – **Piauí** • Água Branca; 05°53′10″S, 042°38′27″W; altitude 222 m; 01.VI.2019; Silva, G.P.B. leg.; 2 ♂, 1 ♀, CCDBIOCCN027. BRAZIL/OLHO D'ÁGUA CREEL – **Piauí** • Teresina; 04°58′50″S, 042°38′18″W; altitude 110 m; 24.IV.2020; Silva, G.P.B. leg.; 1 ♂, 1 ♀, CCDBIOCCN034. BRAZIL/UNIÃO CREEK – **Piauí** • Teresina; 04°54′40″S, 042°47′21″W; altitude 67 m; 15.II.2019; Marques, A. K. leg.; 2 ♂, CCDBIOCCN071. BRAZIL/BEZERRO DAM – **Piauí** • José de Freitas; 04°46′12″S, 042°36′31″W; altitude 122 m; 23.VI.2018; Silva, G.P.B. leg.; 1 ♂, 2 ♀, CCDBIOCCN036. BRAZIL/MARATOÃ RIVER – **Piauí** • Barras; 04°15′09″S, 042°17′17″W; altitude 82 m; 23.VI.2018; Silva. G.P.B. leg.; 1 ♂, CCDBIOCCN042. BRAZIL/PARNAÍBA RIVER – **Piauí** • Murici dos Portelas; 03°19′08″S, 042°05′38″W; altitude 15 m; 24.VI.2018; Silva, G.P.B. leg.; 1 ♂, 1 ♀, CCDBIOCCN056.

Identification. Carapace suborbicularis markedly convex. Downward sloping frontal region; front margin bilobed, smooth. Anterolateral margin of carapace with 5–7 (usually 6) slender, acuminate teeth, which may become smaller, blunt, or faded in larger specimens (Cw > 35 mm). Male abdomen relatively narrow, triangular; straight side edges; individualized abdominal somites, although in some (especially larger females) they are partially coalescing. Gonopod slender (unlike the robust gonopod found in *G. rotundicauda* Magalhães & Türkay, 1996), sinuous, tapering gradually towards the distal portion; weakly curved towards the dorsal side (Figure 2A). Lateroproximal edge concave and uniformly continuous with laterodistal edge (unlike the straight edge with bristles found in *G. rotundicauda*). Marginal suture located on mesial surface, moving abruptly to lateral surface near apex. Field of spines poorly developed, with small spines located on ventral, lateral, and dorsal surfaces (very different from the well-developed set of spines found in *G. rotundicauda*) (Melo 2003).

Distribution. *Goyazana castelnaui* is known only from Brazil where it occurs in perennial environments in some regions (Freita et al. 2013). This species is typical of rivers draining the central Brazilian Shield such as the Araguaia-Tocantins, Xingu, São Francisco, and Upper Paraná (Melo 2003). Notably, it has been found in Maranhão, northeastern Brazil, where it inhabits multiple streams (Andrade et al. 2018). Additionally, is present in the Pajeú River, in the semiarid region of Brazil (Almeida et al. 2023). This species is distributed in the Brazilian states of Pará, Maranhão, Piauí, Tocantins, Pernambuco, Sergipe, Bahia, Goiás, Mato Grosso, Mato Grosso do Sul, and São Paulo (Melo 2003).

Ecology. Information about the ecology of this species is very scarce and present only in the grey literature. These crabs remain below rocks during the day, along the margin, or inside a gallery; however, at night they are active and agile, moving to areas of shallower depths (Freita et al. 2013).

***Sylviocarcinus pictus* (H. Milne-Edwards, 1853)**
Figure 2C, D

Material examined. BRAZIL/PARNAÍBA RIVER – **Piauí** • Amarante; 06°14′28″S, 042°51′17″W; altitude 103 m; 24.IX.2018, Silva, G.P.B leg.; 2 ♂, 3 ♀, CCDBIOCCN014. BRAZIL/PARNAÍBA RIVER – **Piauí** • Murici dos Portelas; 03°19′08″S, 042°05′38″W; altitude 15 m; 24.II.2019, Silva, G.P.B leg.; 1 ♂, CCDBIOCCN055. BRAZIL/LONGÁ RIVER – **Piauí** • Buriti dos Lopes; 03°19′10″S, 041°53′42″W; altitude 8 m; 09.VI.2019, Silva, G.P.B leg.; 1 ♂, CCDBIOCCN061. BRAZIL/GUARIBAS RIVER – **Piauí** • São Luís do Piauí; 06°48′20″S, 041°18′29″W; altitude 282 m; 06.VII.2013, Silva, A.A.S leg.; 5 ♂, 7 ♀, CCDBIOCCN066. BRAZIL/PARNAÍBA RIVER – **Piauí** • Nazária; 05°19′16″S, 042°48′29″W; altitude 68 m; 05.IV.2016, Silva, A.A.S leg.; 2 ♀, CCDBIOCCN068.

Identification. Suborbicular carapace convex, with pattern of small reddish spots, which are not present in *S. maldonadoensis* Pretzmann, 1978. Frontal margin smooth, bilobed. Anterolateral margin of carapace with 3 or 4 sharp triangular teeth, eventually faded. Male abdomen subtriangular, with slightly concave lateral margins. Gonopod slender, distal portion approximately straight, but apex slightly curved in mesio-dorsal direction. Laterodistal edge with distinct pronounced subterminal lobe (Figure 2B). Field of spines with mesial and lateral areas well developed and partially coalescing in the distal part; dorsal area present but reduced. Marginal suture on mesial surface, twisted to the dorsal surface in the distal portion and returning to the mesio-ventral surface near the apex. Apex flattened; narrow and with a long distal opening (Melo 2003).

Distribution. *Sylviocarcinus pictus* has a wide distribution in South America, predominantly associated with large river systems. This species is commonly found in the Amazon and Orinoco basins, as well as in parts of the Paraná river basin, extending its range to include both tropical and subtropical regions. Like

Goyazana castelnaui, *S. pictus* also occurs in semi-arid regions of northeastern Brazil (Rios et al. 2022). It is found in the Guyanas, Colombia, Peru, Bolivia, Argentina, and Brazil (Amapá, Roraima, Amazonas, Pará, Maranhão, Piauí, Rondônia). Its broad distribution highlights the adaptability of the species to varied freshwater environments across diverse climatic regions (Melo 2003; Collins et al. 2009; Andrade et al. 2018).

Ecology. *Sylviocarcinus pictus* is commonly found in rivers, creeks, and lakes, occurring in different types of environments, such as burrows in ravines, cracks or among the branches of submerged roots, hollow tree trunks, or associated with aquatic macrophytes, and under rocks. This species shows gregarious behavior and parental care, the juveniles can cling to their mothers (Melo 2003). Although *S. pictus* occurs in several Brazilian watersheds, little is known about its life history and the reasons for its wider distribution if compared to most other trichodactylids (Magalhães 2016). In northeastern Brazil, despite a remarkable seasonality in terms of precipitation, *S. pictus* seems to be well adapted to the extreme drought, as there are no signs of fully interrupted reproduction (Rios et al. 2022).

Family Pseudotelphusidae

***Kingsleya parnaiba* Pralon, Pinheiro & Santana, 2020**
Figure 3C, D

Material examined. BRAZIL/MANEZINHO CREEK – Piauí • Ribeiro Gonçalves; 07°33′19″S, 045°14′33″W; altitude 196 m; 30.III.2019, Silva, G.P.B leg.; 1 ♂, CCDBIOCCN005.

Identification. G1 sinuous, broadened distally, abdominal surface with distinct curvature mesially, with well-developed mesial process that distinguish it from congeners (*K. attenboroughi* Pinheiro & Santana, 2016 and *K. gustavoi* Magalhães, 2005). Marginal suture in mesial surface, almost straight, displaced to mesial side distally, with several long setae proximally. Lateral suture deep, approximately ⅔ of gonopod length from proximal portion. Marginal process short, broad, subtrapezoidal in mesial view, not projecting distally beyond field of apical spines, distal notch in latero-abdominal surface. Mesial process short, subtriangular, medial portion forming an obtuse angle (straight in *K. attenboroughi*, rounded in *K. gustavoi*), distal portion protruded into sharp conical spine curved in anteromesial direction, mesial process and apical plate fused at base (vs. a mesial process separated by a deep notch from the apical plate in *K. attenboroughi* and a small incision in *K. gustavoi*). Apical plate with 2 large, subtriangular lobes, completely separated from each other by distinct groove in mesial and sternal views (vs. lobes of the apical plate that are separated by a groove distally and fused near the base in *K. attenboroughi* and in *K. gustavoi*), proximal lobe with semicircular protuberance compressed in mesial and sternal views (vs. a proximal lobe with a conspicuous semicircular basal protuberance in *K. attenboroughi* and a proximal lobe of the apical plate partially folded distally over the mesial crest of the field of apical spines in *K. gustavoi*); distal lobe with a median constriction, noticeable in lateral and mesial views. Sperm channel opening near the base of apical plate in sternal view. Apical spine field well developed, more visible in sternal view, curved proximally, with a patch of minute spines concentrated medially, longitudinally directed along abdominal side of apical plate, delimited by mesial border of distal lobe and lateral border of proximal lobe of apical plate, distally closed (Figure 3C, D). G2 (slightly sinuous, almost as long as G1, distinctly slender, distal ¾ tapered; tip flattened, with numerous short spinules on sternal surface (Pralon et al. 2020).

Distribution. This species is endemic to the Parnaíba basin in Piauí state (Pralon et al. 2020).

Ecology. *Kingsleya parnaiba*, which was only recently described (Pralon et al. 2020), inhabits sandy and muddy bottoms of turbid waters and can be in areas heavily impacted by anthropogenic changes to the environment (agricultural expansion, deforestation, pollution, etc.). It is very similar to *K. attenboroughi* but lives in different habitats and hydrographic basins. *Kingsleya parnaiba* is found in the lowland areas of the Parnaíba river valley, approximately 190 m above sea level, whereas *K. attenboroughi* is only found in very small, isolated streams of the Chapada do Araripe, about 750 m above sea level (Pralon et al. 2020).

DISCUSSION

Included here is the first records of *Macrobrachium brasiliense* from the Parnaíba river basin. Based solely on morphological characters, the collected specimens were identified as *M. brasiliense*; however, because of the morphological plasticity of the genus, molecular evidence is needed for confirmation of our identificaiton. Rossi et al. (2020) described *M. veredensis* Rossi et al., 2020 from a population in the São Francisco basin using molecular data, since morphological differences are very subtle, and it is very likely that the same will occur for this population of the Parnaíba River. Our data provides evidence that the distribution of *M. brasiliense* in the Parnaíba river basin is predominantly confined to upper and middle basin. Therefore, our findings highlight the need for further investigation, including detailed habitat assessments and molecular analyses, to understand the precise distribution limits and ecological requirements of *M. brasiliense*.

Conversely, we found that *Macrobrachium olfersii* and *Atya gabonensis* are confined to the middle and lower portions of the Parnaíba river basin. The distribution of these species within the basin appears to be limited upstream by the Boa Esperança Reservoir, the sole dam on the Parnaíba River. The life cycles of these species necessitate some salinity, which is absent in the upper reaches of the river; therefore, the dam acts as a barrier, preventing access to the upper sections where the water is fresher and less conducive to their reproductive needs. This results in populations of *M. olfersii* and *A. gabonensis* being predominantly localized downstream of the reservoir, where the environmental conditions are more aligned with their ecological requirements.

Macrobrachium amazonicum and *Macrobrachium jelskii* demonstrate extensive distribution across the basin, largely due to their significant ecological plasticity. The capacity of *M. amazonicum* to thrive in varied aquatic environments, from fresh- to mildly brackish-water conditions, enables it to colonize a variety of habitats. Similarly, *M. jelskii*, which was introduced to the northeastern Brazil several decades ago, has successfully proliferated owing to its adaptability to diverse environmental conditions. This species' capability to adjust to varying salinity levels, temperatures, and habitat structures has facilitated its widespread establishment. Additionally, Rodrigues et al. (2020) inferred that the presence of dams does not significantly influence the population structure of *M. amazonicum* in Minas Gerais, Brazil, further highlighting the species' resilience and adaptability. The adaptability and resilience of both *M. amazonicum* and *M. jelskii* explain their extensive distribution throughout the Parnaíba river basin.

Another interesting fact that can be extracted from the species distribution is the possible competitive exclusion between *Goyazana castelnaui* and *Sylviocarcinus pictus*. We found these species coexisting in only one locality (Murici dos Portelas). It could be inferred that in all other localities collected, the niche similarity between these two species is too significant for coexistence, leading to competitive exclusion, according to Gause's principle (Rescigno and Richardson 1965). Future population studies may clarify this issue.

Among the species listed in our study, *Kingsleya parnaiba* is the only endemic species, restricted to the Parnaíba river basin. This freshwater crab is found exclusively within this Cerrado region, making it a particularly significant component of the biodiversity of this watershed. Despite its uniqueness, research on *K. parnaiba* remains limited, leaving crucial gaps in knowledge about its habitat preferences, life cycle, and role within the ecosystem (Pralon et al 2020). The region where *K. parnaiba* occurs is subject to intense environmental pressures from extensive monocrop agriculture, including large-scale production of soy, corn, and sorghum, which can degrade water quality and reduce available habitats for native species (Pereira et al. 2018). Our study highlights this knowledge gap, underscoring the need for further ecological and conservation research to better understand the potential impacts of agricultural expansion on *K. parnaiba*.

Certain species previously recorded in the Parnaíba river basin were notably absent in our study. *Macrobrachium acanthurus* (Weigmann, 1836) and *Macrobrachium carcinus* (Linnaeus, 1758), for instance, were not found, likely due to their restriction to the lower delta where higher salinity levels prevail; such conditions are not present in the freshwater-dominated sections surveyed (Lianos et al. 2018). Additionally, the exotic *Macrobrachium rosenbergii* (De Man, 1879) was not encountered, which implies that it has not established a stable population in the Parnaíba river basin (Loebmann et al. 2010). Despite being introduced to various parts of this basin, *M. rosenbergii* has specific ecological requirements and competitive dynamics that may prevent it from thriving there. Its absence highlights the challenges faced by exotic species in establishing themselves in new environments, particularly when local conditions and competition with native species do not support their survival and reproduction. The absence of *Atya scabra* (Leach, 1816) in the São Francisco river basin (Barros-Alves et al. 2021) and species from the genus *Palaemon* Weber, 1795 further highlights the influence of specific ecological niches and habitat preferences on species distribution within the basin. These findings suggest that salinity gradients and habitat specificity are critical factors shaping the distribution patterns of these decapod species in the Parnaíba river basin.

Our study is the most comprehensive freshwater decapod survey of the Parnaíba river basin to date and considerably increases the knowledge of the regional fauna. However, some gaps remain. First, the headwaters of the basin and some tributaries still need to be adequately sampled. Also, more studies are necessary to understand the relationships of the species in the Parnaíba river basin with those from other river systems. Our study is an initial step towards a full account of the freshwater decapod diversity of this biogeographically relevant region.

ACKNOWLEDGEMENTS

We thank the Crustacean Research Team (Biology, UFPI) for supporting our fieldwork. We are also thankful to CNPq (National Council for the Development of Science & Technology, Brazil) for the financial support received (grant for research number: 421393/2016-5) and the Federal University of Piauí (UFPI) for the support provided. FLC thanks the CNPq for the Research Productivity Grant (315997/2021-4). We also thank the anonymous reviewers for all their contributions to the manuscript.

ADDITIONAL INFORMATION

Conflict of interest
The authors declare that no competing interest exists.

Ethical statement
No ethical statement is reported.

Funding
This research was supported by [National Council for the Development of Science & Technology, Brazil-CNPq, grant # 421393/2016-5 to [BGNP]; and, grant # 315997/2021-4 to [FLC]].

Author contributions
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Data availability
All data that support the findings of this study are available in the main text and archived within the Federal University of Piauí research data repository. The data are available upon request from the corresponding author.

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